THURSDAY, JULY 27, 1882

THE MODERN APPLICATIONS OF ELECTRICITY

The Modern Applications of Electricity. By E. Hospitalier. Translated and Enlarged by Julius Maier, Ph.D. (London: Kegan Paul, Trench, and Co., 1882.)

THIS book professes to be a popular account of all the more important practical applications of electricity that have during the last five years drawn so much public attention to that science. No better popular book than that of M. Hospitalier has appeared, and were it not for certain defects, chiefly of style, the present translation by Dr. Julius Maier would have been admirable. It deals in a fairly easy and at the same time fairly accurate manner with many technical matters, and will no doubt prove a very popular work. Part I. treats of the sources of electricity—batteries and dynamo-electric machines. Part II., which is naturally the largest section of the work, is devoted to Electric Lighting. Part III., the least satisfactory perhaps of the whole, and the one that has suffered most by the fact of being a translation of a foreign work, comprises Telephones and Microphones. In the fourth and last section a number of miscellaneous applications are described, including Electric Motors.

We have referred above to certain defects of style apparent in the work before us. It is unusual, to say the least, to speak of the "blades" of a battery in referring to the plates of metal or electrodes. Still less usual is it to call the electrode-poles "rheophores"; a term which probably a great many electricians in this country have never used and do not know of. Neither is it usual to speak of a steam-engine as a "vapor-motor." There are objections against the novel use made by the author or his translator of the term "electrodynamic" as a general adjective to comprise both "magneto-electric" and "dynamo-electric" machines. The word "electrodynamic" has already its own accepted use in the science; and if any extension of that use is necessary, all analogy requires that that extension should be in a direction different from that attempted. It is a dangerous experiment in a "popular" book to meddle with accepted technical terms; for besides being misleading to the public when they subsequently attempt to read other and more strictly scientific books, it makes the author of the popular work look as if he did not understand what he was writing about, when he uses accepted terms in a meaning other than their accepted one. There are other points that strike one as defects. What will the ordinary reader make out of such a sentence as that with which Chapter I. opens? "We can form a fairly exact idea of a battery by comparing it to a focus (*sic*) of heat; *for instance, the furnace of a boiler.*" Or this (p. 14): "To continue our comparison between a battery, the focus of electricity and a focus of heat, we say that *polarisation in a battery is analogous to the want of draught in a chimney.*" This precious piece of nonsense is nearly equalled by the following: "The battery is only used now *in law courts, in national assemblies,* and by some experimenters who for some reason or other cannot set up a steam or gas motor." (These italics are ours.)

But worse than these mild absurdities there are a few positive errors which no reviewer can conscientiously pass over. There is so much that is excellent in M. Hospitalier's work, that it might seem ungracious to point them out. But the only way to keep up the standard of popular scientific works is to point out where their scientific sins lie. In a section devoted to electrical units, we are first told that the "unit of intensity" is the *ampère.* As the author habitually uses "intensity" for electromotive force ("it corresponds to what the French call 'tension,'" he says), we must beg to remark that the definition is wrong. But the book goes on to say (p. 8):—"The ampère is really a perfectly distinct *quantity* of electricity, as a litre is a definite volume, and a kilogramme is definite weight." Wrong again; for the ampère is the standard unit of *strength of current,* and not of either "intensity" or "quantity." To make matters worse, the author adds the following explanation:—"If we say that the intensity of the current traversing a wire is one ampère, we mean by that that the quantity of the current traversing this wire *during one second,* if the current preserves the same intensity, is one ampère." This statement is happily contradicted by one standing on the opposite page of the book, namely, that "a current with an intensity of one ampère yields per second a quantity of electricity equal to one coulomb." But how is the unfortunate reader to know which of these to believe?

The author and translator are more at home in the applications of electricity. Here, however, we must protest against several misstatements and errors. On page 81 comes the preposterous dictum that "*Edison's coil is exactly like Gramme's,*" a statement so absurd that we have only to remind the reader that the Edison armature, so far from being like that of Gramme, coiled on an iron *ring,* is so precisely like that of Siemens, wound shuttle-wise along a *cylinder,* that, as everybody knows, Edison pays Siemens a royalty for the use of this principle. At another part of the book the armature of the Brush machine is said to be "in principle a Pacinotti's ring," but of that famous machine which anticipated that of Gramme, not only in the employment of a ring-armature but in the application of the segmental collector or commutator, and which differs from Brush far more than it differs from Gramme, the authors maintain a complete silence. They speak of the Gramme "collector" as though Pacinotti had never existed.

Turning to incandescent lamps, we find those of Swan, Lane-Fox, and Maxim, fairly described: and due credit is given to these pioneers of the principle of the incandescent lamp. But of Edison's lamp a very poor account indeed is vouchsafed; the filament-lamp of charred bamboo being just casually mentioned, whilst his older lamp, with its horse-shoe of stamped paper, is figured and described in detail.

In describing Faure's accumulator, a modification (due, we believe, to Dr. Fleming) consisting of a number of lead trays, coated with red lead and piled up vertically, is mentioned as if this were the original form. Moreover, we doubt whether "the happy idea of *filling up* the space between the lead plates used by Planté with red lead," would by any means produce the result of "vastly increasing the usefulness" of that excellent apparatus: it would rather destroy it by short-circuiting it.

Lastly, we must protest against the treatment given to Reis's Telephone, of which the book declares that it "has always remained a purely musical apparatus." It is perfectly clear that neither M. Hospitalier nor Dr. Maier can have read Reis's own papers when they make this assertion, which those papers amply refute, and which a careful trial of Reis's own instruments will also amply contradict. Reis invented his instrument, taking the human ear as pattern, *because* the human ear can vibrate to all kind of sounds. He invented it, meaning it to transmit speech, and though it transmitted music better than speech—and both imperfectly—it did, to a certain degree, fulfil its inventor's aim. The author seems in fact to have viewed Reis's invention through the hazy medium of the writings of Count du Moncel, or some less reliable authority; for he mentions Yeates's experiments of 1865 (in which articulate speech was transmitted by a modified Reis instrument with such accuracy that the voices of individual speakers were recognised), and then adds: "The musical telephone might have become an articulating telephone under these conditions, *but this result was not obtained*, partly on account of the imperfection of the instrument, and *partly because Yeates had no such result in view!*" How this extraordinary distortion of well-known facts has crept into the book before us we are at a loss to conjecture. Doubtless the numerous excellent illustrations with which the book is adorned will procure for it a ready sale.

HANDBOOK FOR NORTHERN AND CENTRAL JAPAN

A Handbook for Travellers in Central and Northern Japan, &c., with Maps and Plans. By Ernest Mason Satow, Second Secretary and Japanese Secretary to H.B.M. Legation, and Lieut. A. G. S. Hawes, Royal Marines (Retired). (Yokohama: Kelly and Co.; Shanghai: Kelly and Walsh, 1881.)

AS a mere handbook this work is indispensable to the European traveller in Japan. But it is much more than a handbook, it not only indicates what is sight-worthy, but explains by illustrative myth or legend, drawn from local tradition or from the little explored treasures of Japanese literature, the special interest with which mountains, temples, mounds, groves, and places are invested in the eyes of such Japanese as have not yet abandoned their nationality. To readers of this journal the most valuable portion of the book will be the description as accurate as minute of the Alpine region formed by the provinces of Etchiu and Hida (now the prefectures of Ishikawa and Gifu)—a region difficult of access even to natives, and almost untrodden by Europeans. The mountain range bounding this wild and remote tract on the East is the most considerable in Japan, extending nearly due north and south for some sixty or seventy miles, and rugged with innumerable peaks, the most conspicuous of which, beginning from the north, are Tatéyama, 9500 feet, Goroku-daké, 9100 feet, Yari-ga-také, 10,000 feet, and Norikura, 9800 feet. The chain is not of homogeneous structure, nor are the peaks of contemporaneous origin. The basis is a closegrained granite, not unfrequently rich in garnets. Through this backbone or axis vast masses of igneous and volcanic rock have been extruded, the volcanic rock principally trachytic, often coarse-grained, and occasionally (Tate-yama) columnar. Of the peaks, Yari-ga-také (spear-peak) seems the most ancient, and consists of an intensely hard, foliated rock with curiously contorted siliceous bands and of an almost equally hard porphyry breccia. Nori-kura (ride-saddle) and Tatéyama (steep-hill) are both volcanic. Goroku-daké or Renge (Lotus flower Peak) consists of a mass of trachytic porphyry piled upon and against a close-grained granitic rock. The lower slopes of the range are overlaid, say our authors, by sedimentary rocks, but I am inclined to doubt the accuracy of this statement. Under the fierce sun and incessant rain of summer aërial denudation proceeds at a great rate, especially in the granitic districts of Japan, as may be well seen in the neighbourhood of Kobé, and the existence of a quasi-sedimentary rock may thus be easily accounted for. But true sedimentary rocks, excluding lacustrine deposits or fluvial alluvia, require the agency of the sea, and the greater part of the covering strata of the Japanese islands, is of very recent origin, and has never been under the sea. Only for a few days in early autumn does snow disappear from these peaks, the curiously abrupt and jagged outlines of which recall and even justify the mountain-forms common in Chinese pictures. The fauna of the district is little known. Ptarmigans are common, so also are flying squirrels, as well as bears, two species, of wild boar, and the curious goat-faced antelope. The flora has been more studied. Dense forests clothe the slopes, principally of beech and of several species of oak, mostly evergreen. Conifers are less abundant than is common in Japan. But the pretty 5-leaved *Pinus parviflora*, S. and Z., as well as, though to a less extent, *Cryptomeria japonica*, *Chamæcyparis obtusa*, S. and Z., and *C. pisifera*, S. and Z., are not infrequent. I am not sure, for reasons too long to state here, that the Cryptomeria, despite its frequency, is indigenous to Japan. Two or three kinds of Betula show themselves at elevations of 4000-5000 feet. Below this level many examples of the genera Epilobium, Scabiosa, Hypericum, Parnassia, Euphrasia, Lilium (*L. auratum* and *L. tigrinum*), Hydrangea, Smilax, Akebia, Tylophora, &c., constitute a vegetation by no means without a western European aspect. Above 5000 feet Vaccinium, Diphylleia, Trollius, Paris, *Fragaria vesca*, and Anemone make their appearance. The common Pinguicula is also found, and probably *Loiseleuria procumbens*, which I have gathered on the slopes of Asama-yama, finds a home on those of the Hida mountains. Above 8000 feet a small Dicentra (*D. pusilla*, S. and Z. ?), a yellow violet, *Shortia uniflora*, and *Schizocodon soldanelloides* are to be seen interspersed among bushes of a dwarf azalea. But it is doubtful whether any true Alpine flora exists in Japan.

On Taté-yama the climber passes by some hexagonally columnar examples of andesite, said to have been originally prostrate trunks of trees over which a woman incautiously stepped, which so offended the deities that they were changed into useless blocks of stone. The spot is called Zai-moku-zaka or timber-steep to this day, in commemoration of the fact. Solfataras, it should be mentioned, are as common in this district as in other parts of Japan. A curious means of crossing deep ravines and precipitously walled valleys, known as Kago-